

<http://www.labri.fr/~sutre/Teaching/B>

This document provides a summary of the B notation, both mathematical and ASCII, for B expressions and predicates. In the remainder, E, F, G denote arbitrary expressions, S, T denote set expressions, r denotes a relational expression, f, g denote functional expressions, P, Q denote predicates, n, p denote natural numbers, and z denotes a variable.

1 Predicates

\wedge	conjunction	<code>&</code>
\vee	disjunction	<code>or</code>
\neg	negation	<code>not</code>
\Rightarrow	implication	<code>=></code>
\Leftrightarrow	equivalence	<code><=></code>
\exists	existential quantification	<code>#</code>
\forall	universal quantification	<code>!</code>
\cdot	dot	<code>.</code>
$=$	equality	<code>=</code>
\neq	disequality	<code>/=</code>
$E \mapsto F$	ordered pair	<code>E -> F</code>

2 Integers

\mathbb{Z}	set of all integers	<code>INTEGER</code>
\mathbb{N}	set of all nonnegative integers	<code>NATURAL</code>
\mathbb{N}_1	set of all positive integers	<code>NATURAL1</code>
$\{n, n + 1, \dots, p\}$	interval of integers	<code>n . . p</code>
$>$	strictly greater	<code>></code>
\geq	greater or equal	<code>>=</code>
$<$	strictly less	<code><</code>
\leq	less or equal	<code><=</code>
$+$	addition	<code>+</code>
$-$	subtraction	<code>-</code>
\times	multiplication	<code>*</code>
$/$	integer division	<code>/</code>
<code>mod</code>	modulo	<code>mod</code>
<code>min(S)</code>	minimum of S	<code>min(S)</code>
<code>max(S)</code>	maximum of S	<code>max(S)</code>
$\sum z \cdot (P E)$	sum of E for z satisfying P	<code>SIGMA(z) . (P E)</code>
$\prod z \cdot (P E)$	product of E for z satisfying P	<code>PI(z) . (P E)</code>

3 Sets

$\mathbb{P}(S)$	set of all subsets of S	$\text{POW}(S)$
$\mathbb{P}_1(S)$	set of all non-empty subsets of S	$\text{POW1}(S)$
$\mathbb{F}(S)$	set of all finite subsets of S	$\text{FIN}(S)$
$\mathbb{F}_1(S)$	set of all non-empty finite subsets of S	$\text{FIN1}(S)$
\emptyset	empty set	$\{\}$
$\{E, F, \dots, G\}$	set enumeration	$\{E, F, \dots, G\}$
$\{z \mid P\}$	set comprehension	$\{z \mid P\}$
\in	membership	:
\notin	negation of membership	/:
\subseteq	inclusion	<:
$\not\subseteq$	negation of inclusion	/<:
\subset	strict inclusion	<<:
$\not\subset$	negation of strict inclusion	/<<:
\cup	union	\vee
\cap	intersection	\wedge
$-$	difference	-
\times	cartesian product	*
$\text{card}(S)$	cardinal of S	$\text{card}(S)$

4 Relations

$S \leftrightarrow T$	set of all relations from S to T	$S \leftrightarrow T$
$\text{dom}(r)$	domain of r	$\text{dom}(r)$
$\text{ran}(r)$	co-domain of r	$\text{ran}(r)$
$\text{id}(S)$	identity on S	$\text{id}(S)$
$;$	composition	$;$
$s \triangleleft r$	domain restriction of r by s	$s \triangleleft r$
$r \triangleright t$	co-domain restriction of r by t	$r \triangleright t$
$s \triangleleft\!\!\triangleleft r$	domain subtraction of r by s	$s \triangleleft\!\!\triangleleft r$
$r \triangleright\!\!\triangleright t$	co-domain subtraction of r by t	$r \triangleright\!\!\triangleright t$
r^{-1}	inverse of r	r^{-1}
$r[s]$	image of s under r	$r[s]$
$r \triangleleft\!\!\triangleleft r'$	overriding of r by r'	$r \triangleleft\!\!\triangleleft r'$
r^n	n -th iterate of r	$\text{iterate}(r, n)$
r^*	reflexive-transitive closure of r	$\text{closure}(r)$

5 Functions

$S \rightarrow T$	set of all partial functions from S to T	$S \rightarrow T$
$S \rightarrow T$	set of all total functions from S to T	$S \rightarrow T$
$S \mapsto T$	set of all partial injections from S to T	$S \mapsto T$
$S \mapsto T$	set of all total injections from S to T	$S \mapsto T$
$S \twoheadrightarrow T$	set of all partial surjections from S to T	$S \twoheadrightarrow T$
$S \twoheadrightarrow T$	set of all total surjections from S to T	$S \twoheadrightarrow T$
$S \xrightarrow{\sim} T$	set of all total bijections from S to T	$S \xrightarrow{\sim} T$
$\lambda z \cdot (P \mid E)$	lambda expression	$\lambda(z) \cdot (P \mid E)$
$f(E)$	value of f in E	$f(E)$